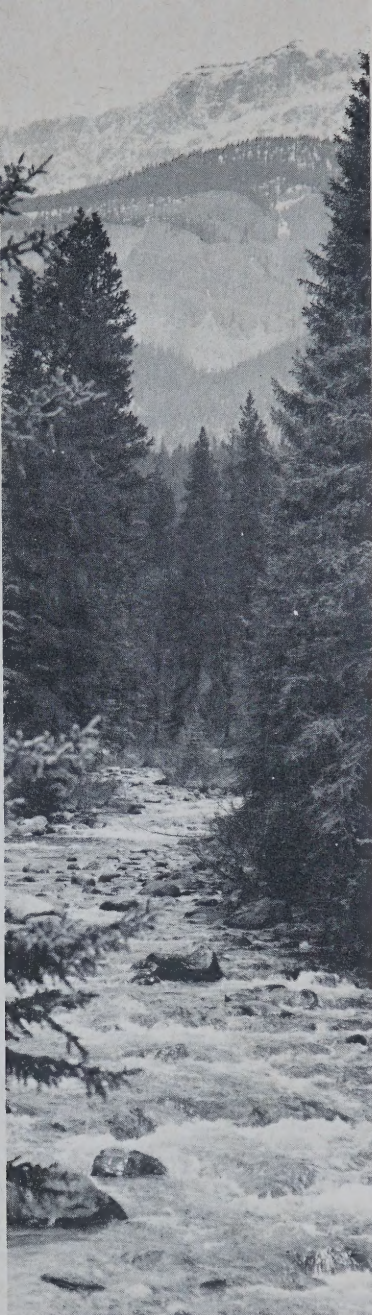
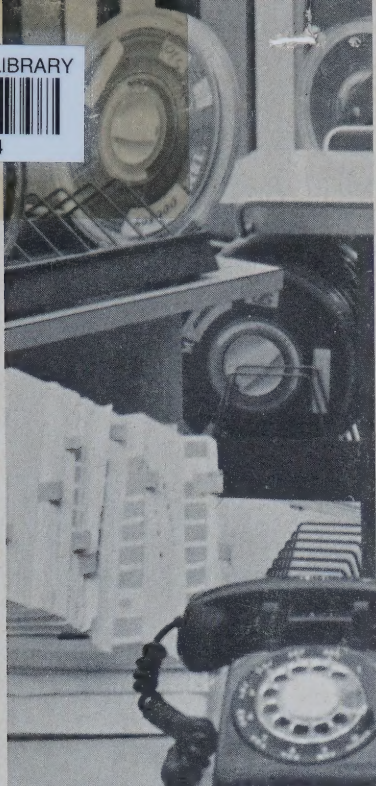


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# Alberta

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MUNICIPAL ENGINEERING BRANCH  
POLLUTION CONTROL DIVISION  
DEPARTMENT OF THE ENVIRONMENT

FLUORIDE SURVEY

-1973-

ALBERTA ENVIRONMENT

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WATER FLUORIDATION:

Its History, Control and  
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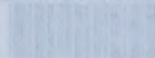
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## APPENDIX

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**WATER FLUORIDATION:** Fluoridation has been a controversial subject.

### **Its' History, Control and**

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### **Prepared by:**

**Allen K. Kennedy**

Water fluoridation has a long history in exact engineering science. Under governmental controls and regulations, municipal water supplies maintain a relatively constant Fluoride Ion concentration of 1.0 milligrams per litre. There are various feeding mechanisms on the market and these, coupled with the various commercial sources of Fluoride Ion result in a very economical and accurate treatment of water where desired.

Fluoridation is widespread in Alberta. There are presently forty-one communities using artificially fluoridated water; of these, thirty-four have their own fluoridation programs and seven receive water from the City of



## A B S T R A C T

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Fluoridation is widespread in Alberta. There are presently forty-two communities using artificially fluoridated water; of these, thirty-four have their own fluoridation program and seven receive water from the City of



Edmonton water distribution system (Table I). A "Fluoride survey" carried out by the Municipal Engineering Branch, Pollution Control Division, Department of the Environment in May and June of 1973 showed that most of the thirty-two communities are doing an acceptable job of maintaining fluoride ion concentration in their water at 1.0 milligrams per litre. The survey indicated, however, that the testing of water for fluoride ion by treatment plant operators requires upgrading and review.

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## Introduction

Fluoridation of water supplies is now a generally accepted practice. It was not always so. The history of fluoridation, its' engineering implications, its' status in Alberta, and the control of fluoridation constitutes the basis of this report.



## CHAPTER I

### History of Fluoridation

As early as 1901, dentists throughout the world were beginning to notice a staining of teeth in some localities. The most comprehensive study was undertaken by Dr. Frederick McKay, a dentist who first noticed the staining (or mottling) of teeth in Colorado Springs in 1902. In the following three decades, McKay travelled throughout the country, comparing his findings with those of others. He found that mottled teeth (or endemic fluorosis as it is known) were very prevalent in America. His findings showed that fluorosis occurred in sharply defined areas. For example, the towns of Bauxite, and Benton in Arkansas were only five miles apart, but all children in Bauxite had mottled teeth, while the population of Benton had normal teeth. This was typical of McKay's findings. Throughout the years, various factors had served to indicate that something present in the drinking water of a community caused the fluorosis. What this unknown substance was could not be determined with the analytical procedures then in use. One other fact had come to McKay's attention throughout his many years of studying mottled enamel. although the tooth enamel could be completely destroyed by fluorosis, mottled teeth usually showed "a singular absence of decay". This final conclusion, which was to become so important in years to come, was not afforded much significance by McKay and his colleagues.

It was not until 1931 that the cause of mottled teeth was discovered. The Aluminum Company of America had a mine in Bauxite, Arkansas. The company was concerned that the public would blame the mottled teeth of children in Bauxite on aluminum, and thus the entire market for aluminum





cookware would be lost. The company assigned their chief chemist to analyze the water supply for Bauxite, and to concentrate on trace elements - those usually not detected by routine analysis. It was found that the water had a relatively high concentration of fluorine - 13.7 mg/l. Dr. McKay was notified of these findings and immediately had water from other areas of the country analyzed for fluorine content. It was shown that in every area where mottled teeth occurred, the water had a content of over 2.0 mg/l, and the fluorine concentration was always lower in areas where the population had normal teeth. About the same time, a team of scientists in Arizona succeeded in producing fluorosis in rats by feeding them high-fluoride diets. From these and follow-up experiments, fluorine was isolated and identified as the cause of mottled teeth.

It was not for about three years following this discovery that dental researchers turned their attention to another finding of McKay's early surveys - that "mottled teeth showed a very low incidence of dental caries". This concept was studied, discussed and verified for the next four years. In all studies the findings were the same - mottled teeth were generally free from decay. In 1939 the first large scale survey was undertaken; twenty-one cities with fluoride concentrations in their water supplies varying from 0.1 mg/l to 2/5 mg/l were chosen for study. It took two years to examine the 7,000 children chosen as subjects and two more years to compile the statistics. In 1943 the findings were made public:

"Of the twenty-one cities surveyed, Michigan City, Indiana, with a fluoride concentration of 0.1 mg/l in the water supply has the highest incidence of dental caries. Galesburg, Illinois, with 1.9 mg/l has the lowest rate of decay. Fluorine concentrations of 1.0 mg/l make for strikingly low dental caries prevalence and cause only sporadic instances of the





mildest forms of dental fluorosis. These mild forms of fluorosis have no aesthetic consequences whatsoever." (1)

Thus the scientific world had a safe but effective level of fluorine to prevent tooth decay. The next step was the fluoridation of the water of a small city, with another similar city using unfluoridated water as a control. This was undertaken in 1945 in various areas of North America. Grand Rapids, Michigan; Newburgh, New York; Brantford, Ontario; and Sheboygan, Wisconsin, all undertook ten to fifteen year "study programs" to determine the effectiveness and side effects of drinking fluoridated water. Various Medical and Dental Associations were optimistic about the possibilities of fluoridation, but urged extreme caution because long term effects were not known. However, when reports of tremendous reduction of the incidence of dental caries in the test cities were made public, many communities decided to proceed with their own fluoridation programs. All reports were good, and with growing support from the medical, dental and scientific communities, the councils of many cities and towns across the continent committed themselves towards a program of fluoridating the municipal water supplies to reduce the incidence of dental caries, especially in children.

The fluoridation of water seemed to be an ideal program; it was simple, relatively inexpensive, and appeared to benefit the entire population with no side effects. It was estimated that fluoridated water would reduce the dental expenses of the population by 50% to 75% simply by reducing the incidence of decay in the teeth of the children of the community. It was at this time, about 1947, with support growing daily, that opposition to fluoridation programs first came to the public attention. The oppositions



from citizens groups started political and legal battles which were to continue for the next 20 years.





### Opposition to Fluoridation

By 1950, fluoridation was rapidly gaining support from various scientific bodies. There had always been some opposition to fluoridation of water but it was felt that more widespread acceptance would end this. However, as support increased, so did opposition to fluoridation.

One of the most valid and effective arguments was that sodium fluoride, which was then the major source of fluoride ions, is a major constituent of rat poison. This was a very terrifying thought to the anti-fluoridation forces. They viewed all fluoride compounds as "poison" and failed to differentiate in concentrations. A logical upshot of this argument was that an "enemy of the country" could poison and kill the entire population of a city simply by altering the controls on the fluoride addition equipment. These arguments were not substantiated by any of the numerous tests carried out. Fluoride ion concentrations of 1.0 mg/l were found to be non-toxic. A lethal dose of sodium fluoride for a human is approximately 1000 mg/l and this could never be obtained in a water treatment plant either accidentally or intentionally, as not enough chemicals would be available.

Another argument was that fluoride ions, even in low concentrations, had a cumulative effect and eventually caused a variety of diseases. The list of disorders alleged to be caused or made worse by the consumption of fluoridated water is endless. It covered every conceivable medical problem from cancer to flat feet, from polimyelitis to sterility, from tuberculosis to left-handedness. The entire range of medical problems was at one time or another blamed on fluorides in water, but from studies carried out by many reputable organizations, no proof was ever found that fluoridated water was in any way injurious to human health.



One of the most persistent and widely used arguments against fluoridation of public water supplies, was that fluorides are a medicine, and treatment of municipal supplies was mass-medication which was an infringement on a persons civil rights. This argument was taken to court in several cases, but all rulings were the same; that fluorides added to water were not a medicine, but a facet of preventative dentistry and that a persons rights were not being forfeited. However, the courts did rule that for those people who did not want to consume fluoridated water, either a household filter to remove fluorides or a de-fluoridated water tap must be provided. In most cases, the community would provide at some place in the system, a tap for fluoride-free water from which the population could haul water to their homes if they so desired.

These same arguments appeared time and time again - wherever fluoridation was being considered. Most communities decided the issue by means of a referendum, thus long and loud, political battles were waged in communities all over North America before fluoridation was accepted or rejected.

Opposition to fluoridation started to die out by the latter 1960's. Because cities like Brantford and Grand Rapids had been fluoridating for over 20 years with nothing but good results, many arguments were proved inconslusive. More medical, dental, scientific and educational associations were supporting fluoridation with each passing year so anti-fluoridation forces were finding it harder to produce "reliable sources". In all, fluoridation of public water supplies has become a very common practice in North America and around the world, and results of the programs are excellent, with a marked reduction in the incidence of dental caries wherever fluoridation programs are in operation.





## CHAPTER II

### Engineering Aspects of Fluoridation

Simply stated, the application of fluorides to water for dental caries control consists of the addition of a small volume of chemical to a relatively large volume of water. The practicability of adding the small amount of fluoride was questioned at the start of the program. However, this was no problem since equipment utilized in waterworks and industrial practice would permit the addition of fluoride compounds in proper quantity to any water supply. It was only necessary to adapt the equipment and to apply necessary safeguards to prevent accidental overdose.

The feeding devices that are being used for the application of fluorides are accurate to within plus or minus 5 percent of the selected rate. This degree of accuracy is more than sufficient to assure applicating within the optimum caries control range and to avoid fluorosis.

To ensure that the equipment selected for application of fluorides is suitable for the purpose and that controls have been established to safeguard the public and operating personnel, Provincial Government requires submission and approval of plans and specifications. The province also requires daily fluoride determinations and monthly submission of operation reports to the Pollution Control Division, Department of the Environment.

#### Fluoride Feed Equipment

The equipment used for the application of fluorides to a water supply can be placed in two general classes, namely, solution feed



equipment and dry feed equipment. Separation into these classifications is based on the method of measuring the applied fluoride compound. When the fluoride compound is measured in a solution, the equipment is classed as a solution feeder; when the compound is measured as a powder, the equipment is termed a dry feeder.

The solution feeders that are being used for the application of fluorides utilize three different means of measuring the applied solution. One type of feeder is a positive displacement diaphragm or plunger pump which measures an equal volume of solution per revolution. Feed pumps of this type usually have stroke length and stroke frequency adjustments. Another type of feeder consists of an adjustable orifice in a constant head box, and the level of solution in the head box is maintained by means of a float-actuated valve. The third type of solution feeder operates by measuring the withdrawal of liquid from the solution tank; this is accomplished by controlling the rate of lowering of an intake device which draws from the surface of the liquid in the tank. Displacement pump type feeders can apply the solution directly against a pressure, while the other two types of feeders are best used where the solution can flow by gravity to the point of application.

Dry feed equipment used in the application of fluorides is of two types, volumetric or gravimetric. In the volumetric type of feeder the dry powder is measured by volume. The construction of volumetric feeders varies, most units measuring the volume by means of an adjustable interceptor blade located over a revolving disk. Gravimetric feeders actually weigh out the chemical added. The common type utilizes a travelling belt, movement of which is actuated when the feeding mechanism





is out of step with a balance counterpoise, the counterpoise moving along a balance beam at a uniform speed for any given feed rate of the equipment. The gravimetric type feeder is usually more accurate than the volumetric feeder and is generally installed in the larger waterworks. All dry feed units include a hopper into which the chemical is initially placed. The measured or weighed chemical falls into a solution pot to which a stream of water is added to place the chemical in solution or to form a slurry so that it may be conveyed to the point of application, or to an auxiliary solution tank from which it may be pumped or ejected.

Solution feed equipment is most flexible since the rate of feed can be controlled by changing the concentration of the fluoride ion in solution. Such equipment, therefore, can be used to apply fluorides to water supply systems pumping from several thousand to many millions of gallons per day, taking into consideration all of the available sources of fluorides.



## Chemicals Used For Fluoridation

### Sodium Fluoride (NaF)

Sodium Fluoride can be applied either as a solution or a dry powder. As a solution, it may be handled in saturated or undersaturated conditions. Any of the types of solution feeders heretofore described, may be used, with the most common type of application being by means of the displacement pump.

Most of the installations using sodium fluoride solutions as a source of fluoride ion feed an undersaturated solution with a concentration of 2 to 3 1/2 percent. With such equipment a weighed amount of sodium fluoride powder is added to a measured volume of water in a solution tank. The amount of fluoride applied each day is calculated from the volume of solution added to the water supply.

Sodium fluoride has a relatively uniform concentration over the ranges of temperatures found in waterworks practise, and, therefore can be applied as a saturated solution. Any desired amount of chemical can be placed in a solution tank, usually of stainless steel fabrication, to which water is automatically admitted by means of a float valve. A soft or softened water is desirable to prevent incrustation, and a granular type of sodium fluoride is generally used. The amount of fluoride applied daily to the water supply can be determined by metering the water admitted to the saturator tank and calculating the fluoride removed or displaced therefrom. Normally use of sodium fluoride solutions (saturated or undersaturated) is limited to installations pumping less than one million gallons daily.

Sodium fluoride can also be applied by means of dry feed units.



With volumetric feeders, application can be made to water supplies where the pumping rate is 100,000 gallons per day or more. Such dry feed equipment can be used for very large supplies although it is customary to utilize gravimetric feeders for large plants. Volumetric feeders are usually mounted on a scale so that the total daily use of chemical can be determined. Gravimetric feeders may be used on supplies pumping at a rate of as little as 1.25 million gallons per day. Such feeders, as previously stated, are usually only installed in the very large plants.

Because of the formation of slightly soluble compounds upon addition of sodium fluoride to hard waters, incrustation of feeder solution pots and feed lines has resulted. Flexible rubber or plastic tubing has been used to minimize difficulty, and occasionally superphosphates are added with the sodium fluoride to reduce incrustation.

#### Sodium Silicofluoride ( $\text{Na}_2\text{SiF}_6$ )

When sodium silicofluoride is used as the source of fluoride ion, it is usually applied by means of a dry feeder because of the low solubility. Volumetric feeders may be used on supplies pumping at a rate as low as 150,000 gallons per day, while gravimetric type feeders can be used on supplies with pumping rates greater than 1.7 million gallons per day.

On very small supplies, sufficient water can be added at the solution pot to place the chemical in solution. However, on larger installations this proves impractical so the chemical is added as a slurry. Because of the corrosive nature of a slurry of sodium silicofluoride, plastic feed lines are generally used.

#### Hydrofluosilicic Acid ( $\text{H}_2\text{SiF}_6$ )

Hydrofluosilicic Acid, because of its high concentration of





fluoride ions (79.2%), is becoming increasingly popular as a fluoridation chemical. This acid is usually applied in the concentration received from the manufacturer (22-30%) by means of a diaphragm-type pump. Supplies pumping at rates from 0.60 to 60 million gallons daily can be served using undiluted 30% acid. With lower concentrations, slightly smaller installations can be treated. For small plants, the acid can be diluted; however, the advantages of this chemical over others are largely lost upon dilution.

The chemical is usually pumped directly from the barrel in which it was received from the manufacturer. Rubber or plastic feed lines must be used to prevent corrosion.

#### Hydrofluoric Acid ( H F )

Hydrofluoric acid is used as a fluoridation chemical only in Madison, Wisconsin. It was selected for use there because of lack of space in unit well stations for storage of chemicals. Additional installations are not recommended because of the hazard involved in the use of this highly corrosive acid.



ALBERTA FLUORIDE SURVEY, 1973

Carried out by:

Municipal Engineering Branch  
Pollution Control Division  
Department of the Environment  
1973





CHAPTER III

Alberta Fluoride Survey - 1973

The Fluoridation Regulations of the Clean Water Act of the Province of Alberta state that the fluoride ion concentration in drinking water must be maintained at 1.0 milligrams per litre, with a monthly average variation of  $\pm 0.1$  mg/l and a daily variation of  $\pm 0.2$  mg/l as limits. The regulations also state that the equipment used for feeding the fluoride chemical to the water must be capable of maintaining a feed rate within five percent of that at which the control is set.

Fluoride surveys are periodically undertaken to assess the performance of the municipal fluoridation programs, and to ensure that provincial regulations are being met. The surveys also serve as a means to cross-check the results being obtained by the fluoride testing apparatus in the communities, and at the Pollution Control Division.

Following is a summary of the Fluoride Survey carried out in May and June of 1973.



### Fluoride Survey

At the time of the survey thirty-two communities (See Table I) were fluoridating their water supply. Each community was sent two samples of water with known fluoride ion concentration. One had a fluoride ion concentration of 1.2 mg/l and the other contained 0.2 mg/l of fluoride ion. The water plant operator in the community did two separate tests for fluoride concentration on each sample, then took samples of his own raw and fluoridated water, and performed two tests on each of these. The remainder of the sample was then forwarded to the Pollution Control Division and another set of results thus obtained. In this manner, two separate analyses were performed on the same sample of water and a correlation of results was obtained. The figures and breakdown on them are presented in Tables II and III of the Appendix.



### Discussion

Results of the survey (Table II) indicate that many of the communities tests are not accurate when testing for fluoride ion concentrations of less than 0.40 mg/l. The sample of non-fluoridated water sent out (concentrations 0.20 mg/l) was accurately tested by only three of the twenty-seven communities replying (Table III). The majority (22) of the results were too high; only two tested too low. On their own raw water, the communities results were slightly better, with nine being accurate. Of the remainder, twelve were too high and nine were too low (Table III).

Results are markedly better for water with a fluoride ion concentration of approximately 1.0 mg/l. The sample of fluoridated water sent out (concentration 1.2 mg/l) was accurately tested by eighteen communities; five tested too high and four too low, (Table III). Tests completed by each community on their own tap water were not as accurate, but still acceptable. Thirteen results were good, nine tested too high, and only three were too low (Table III).





### Conclusions

These figures indicate that the test procedures used by the operators requires review, especially for the testing of water with low fluoride ion concentration (i.e. their raw water prior to fluoridation).

In terms of fluoride ion concentration in their drinking water, most of the communities are doing an acceptable job of maintaining a concentration of 1.0 mg/l. Eighteen are within acceptable limits, six are too low, and only two exceeded the limits. This shows that most artificially fluoridated water supplies are being suitably treated, but testing of the water by treatment plant operators is less than satisfactory and requires review and upgrading. The communities which showed consistently poor test results were requested to review their testing procedures and check their testing equipment for accuracy.



### Recommendations

1. Each community should have a standard solution with a fluoride concentration of 0.10 mg/l for use in calibrating their testing apparatus when analyzing raw water. This would be in addition to the standard of 1.0 mg/l which is supplied with the testing apparatus.
2. Maintenance records should be sent from each community to the Municipal Engineering Branch indicating any and all repairs and adjustments which are made to their fluoride testing apparatus. These records should be enclosed with the regular monthly fluoride reports.
3. A review should be made of the operator's testing procedure, and where necessary, an upgrading of the operator's methods should be undertaken.



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List of Alberta Communities Using Fluoridated Water . . . . . A1

TABLE II

Results of Fluoride Survey, 1973 . . . . . A2

TABLE III

Results of Tests Conducted by Communities . . . . . A5

TABLE IV

Fluoride Ion Content of Municipal Water Supplies . . . . . A6



TABLE I

List of Alberta Communities Using Fluoridated Water

A. Communities With Their Own Fluoridation Program

- |                     |                                             |
|---------------------|---------------------------------------------|
| 1. Athabasca        | 18. Innisfail                               |
| 2. Barrhead         | 19. Kinuso                                  |
| 3. Bonnyville       | 20. Mayerthorpe                             |
| 4. Bow Island       | 21. Milk River                              |
| 5. Cardston         | 22. Peace River                             |
| 6. Coaldale         | 23. Picture Butte                           |
| 7. Cold Lake        | 24. Pincher Creek                           |
| 8. C.F.B. Cold Lake | 25. Red Deer                                |
| 9. Devon            | 26. Slave Lake                              |
| 10. Drumheller      | 27. St. Paul                                |
| 11. Edmonton        | 28. C.F.B. Suffield                         |
| 12. Fairview        | 29. Taber                                   |
| 13. Fort McMurray   | 30. Vegreville                              |
| 14. Grande Prairie  | 31. Westlock                                |
| 15. Hanna           | 32. Whitecourt                              |
| 16. Hays            | 33. Morinville ( started November, 1973)    |
| 17. Hinton          | 34. Drayton Valley (started November, 1973) |

B. Communities Receiving Edmonton Water

- |                 |                      |
|-----------------|----------------------|
| 1. Beaumont     | 5. Fort Saskatchewan |
| 2. Leduc        | 6. St. Albert        |
| 3. Stony Plain  | 7. Redwater          |
| 4. Spruce Grove |                      |





TABLE 11

Results of Fluoride Survey, 1973

All results expressed as milligrams per litre

| Community        | Sample #1<br>(1.2 mg/l) | Sample #2<br>(0.2 mg.l) | Raw Water              |                                             | Fluoridated Water      |                                             |
|------------------|-------------------------|-------------------------|------------------------|---------------------------------------------|------------------------|---------------------------------------------|
|                  |                         |                         | Community's<br>Results | Pollution<br>Control<br>Division<br>Results | Community's<br>Results | Pollution<br>Control<br>Division<br>Results |
| Athabasca        | 1.15<br>1.10            | 0.15<br>0.20            | 0.18<br>0.21           | 0.27                                        | 0.89<br>0.85           | 0.52                                        |
| Barrhead         | 1.05<br>1.15            | 0.80<br>0.65            | 0.60<br>0.55           | 0.09                                        | 0.98<br>1.07           | 0.80                                        |
| Bonnyville       | 1.0<br>1.0              | 0.1<br>0.1              | 0.3<br>0.2             | 0.42                                        | 0.8<br>0.7             | 0.92                                        |
| Bow Island       | 1.00<br>1.05            | 0.20<br>0.25            | 0.25<br>0.25           | 0.30<br>0.20                                | 0.50                   | 0.35<br>0.50                                |
| Cardston         | 1.25<br>1.30            | 0.42<br>0.40            | 0.25<br>0.25           | 0.10                                        | 0.74<br>0.73           | 0.48                                        |
| Coaldale         | 1.50<br>1.50            | 0.50                    | 0.35<br>0.35           | 0.22                                        | 1.19<br>1.15           | 1.07                                        |
| Cold Lake        | 1.14<br>1.14            | 0.20<br>0.20            | 0.09<br>0.08           | 0.25                                        | 1.02<br>0.99           | 1.05                                        |
| C.F.B. Cold Lake | 1.32<br>1.38            | 0.39<br>0.48            | 0.35<br>0.36           | 0.11                                        | 1.12<br>1.05           | 0.80                                        |
| Devon            | 1.15<br>1.11            | 0.25<br>0.25            | 0.14<br>0.14           | 0.23                                        | 1.25<br>1.23           | 1.03                                        |
| Drumheller       | 1.3<br>1.25             | Lost in<br>Mailing      | 0.42<br>0.41           | 0.44                                        | 0.99<br>1.00           | 1.18                                        |
| Edmonton         |                         |                         |                        | 0.05                                        |                        | 1.05                                        |

continued



Continued -

TABLE II

| Community      | Sample #1<br>(1.2 mg/l)          | Sample #2<br>(0.2 mg/l) | Raw Water              |                                             | Fluoridated Water      |                                             |
|----------------|----------------------------------|-------------------------|------------------------|---------------------------------------------|------------------------|---------------------------------------------|
|                |                                  |                         | Community's<br>Results | Pollution<br>Control<br>Division<br>Results | Community's<br>Results | Pollution<br>Control<br>Division<br>Results |
| Fairview       | 1.48<br>1.42                     | 0.41<br>0.42            | 0.55<br>0.56           | 0.31                                        | 0.94<br>0.94           | 0.87                                        |
| Fort McMurray  | 1.22<br>1.25                     | 0.35<br>0.35            | 0.40<br>0.40           | 0.10                                        | 0.89<br>0.86           | 0.72                                        |
| Grande Prairie | 1.15<br>1.18                     | 0.28<br>0.28            | 0.18<br>0.20           | 0.47                                        | 0.85<br>0.85           | 1.08                                        |
| Hanna          | 1.25<br>1.22                     | 0.25<br>0.24            | 0.26<br>0.24           | 0.25                                        | 1.13<br>1.13           | 1.12                                        |
| Hays           | 2.05<br>2.07                     | 0.40<br>0.45            | 0.45<br>0.40           | 0.45                                        | 1.00<br>1.01           | 0.98                                        |
| Hinton         | 1.27<br>1.19                     | 0.34<br>0.30            | 0.30<br>0.31           | 0.34                                        | 1.0<br>1.0             | 0.98                                        |
| Innisfail      | NO RESULTS, HACH KIT INOPERATIVE |                         |                        |                                             |                        |                                             |
| Kinuso         | NO RESULTS, HACH KIT INOPERATIVE |                         |                        |                                             |                        |                                             |
| Mayerthorpe    | Did not<br>Receive<br>Samples    | 0.46<br>0.45            | 0.49<br>0.46           | 0.45                                        | Fluoridation           | Suspended                                   |
| Milk River     | 1.30<br>1.30                     | 0.0<br>0.0              | 0.0<br>0.0             | 0.01                                        | 1.00<br>1.00           | 1.00                                        |
| Peace River    | 1.3<br>1.3                       | 0.42<br>0.42            | 0.35<br>0.38           | 0.08                                        | 1.05<br>1.05           | 0.92                                        |
| Picture Butte  | 1.25<br>1.30                     | 0.30<br>0.30            | 0.40<br>0.40           | 0.30                                        | 1.00<br>1.00           | 0.93                                        |
| Pincher Creek  |                                  |                         |                        |                                             |                        |                                             |

continued



Continued -

TABLE II

| Community       | Sample #1<br>(1.2 mg/l) | Sample #2<br>(0.2 mg/l) | Raw Water              |                                             | Fluoridated Water      |                                             |
|-----------------|-------------------------|-------------------------|------------------------|---------------------------------------------|------------------------|---------------------------------------------|
|                 |                         |                         | Community's<br>Results | Pollution<br>Control<br>Division<br>Results | Community's<br>Results | Pollution<br>Control<br>Division<br>Results |
| Red Deer        | 1.35<br>1.35            | 0.35<br>0.39            | 0.28<br>0.21           | 0.24                                        | 1.04<br>1.07           | 0.92                                        |
| Slave Lake      | 1.20<br>1.20            | 0.39<br>0.36            | 0.25<br>0.23           | 0.05                                        | Fluoridation           | Suspended                                   |
| St. Paul        | 1.15<br>1.10            | 0.25<br>0.25            | 0.20<br>0.25           | 0.31                                        | 0.90<br>0.90           | 0.92                                        |
| C.F.B. Suffield | 1.0<br>1.0              | 0.30<br>0.25            | 0.15<br>0.15           | 0.26                                        | 1.00<br>1.00           | 1.01                                        |
| Taber           | 1.28<br>1.28            | 0.29<br>0.31            | 0.20<br>0.19           | 0.21                                        | 1.00<br>0.98           | 0.94                                        |
| Vegreville      | 1.10<br>1.05            | 0.25<br>0.27            | 0.35<br>0.30           | 0.39                                        | 1.00<br>1.05           | 1.03                                        |
| Westlock        | 1.18<br>1.21            | 0.58<br>0.48            | 1.01<br>1.28           | 0.93                                        | 1.10<br>1.12           | 1.20                                        |
| Whitecourt      | 1.02<br>1.15            | 0.50<br>0.50            | 0.30<br>0.30           | 0.13                                        | 0.95<br>0.95           | 0.79                                        |





TABLE III

Results of Test Conducted by Communities

| Sample                                  | Too High  | Too Low   | High      |
|-----------------------------------------|-----------|-----------|-----------|
| Sample #1<br>(1.2 mg/l)<br>Percent      | 5<br>19%  | 4<br>15%  | 18<br>66% |
| Sample #2<br>(0.2 mg/l)<br>Percent      | 22<br>82% | 2<br>7%   | 3<br>11%  |
| Raw Water<br>(Town's Supply)<br>Percent | 12<br>40% | 9<br>30%  | 9<br>30%  |
| Tap Water<br>(Town's Supply)<br>Percent | 9<br>36%  | 3<br>12%  | 13<br>50% |
| TOTAL<br>PERCENT                        | 48<br>44% | 18<br>17% | 43<br>40% |



TABLE IV

Fluoride Ion Content of Municipal Water Supplies

(based on a single test survey)

| <u>Content</u> |                     | <u>Number</u> | <u>Percent</u> |
|----------------|---------------------|---------------|----------------|
| 1.00 mg/l      | ± 0.10 mg/l         | 16            | 62%            |
| 1.00 mg/l      | ± 0.10 to 0.20 mg/l | 6             | 23%            |
| 1.00 mg/l      | ± over 0.20 mg/l    | 4             | 15%            |

Average value (communities tests) 0.97 mg/l

Average value (Pollution Control Division Tests) 0.92 mg/l



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